

Influenza Laboratory Diagnosis and Surveillance

*Enhancing Connectivity Between Public
Health and Clinical Laboratories*

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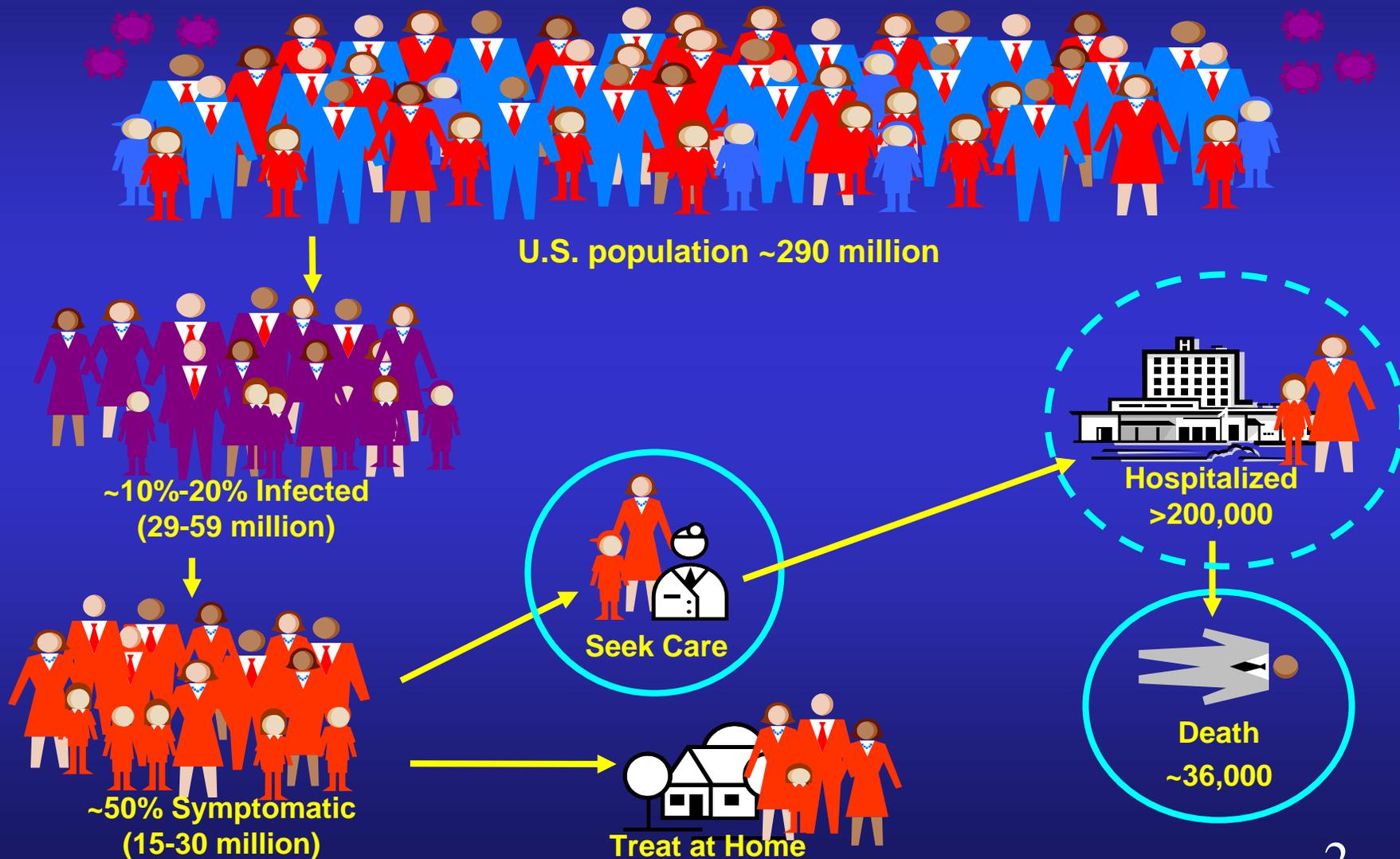
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Influenza

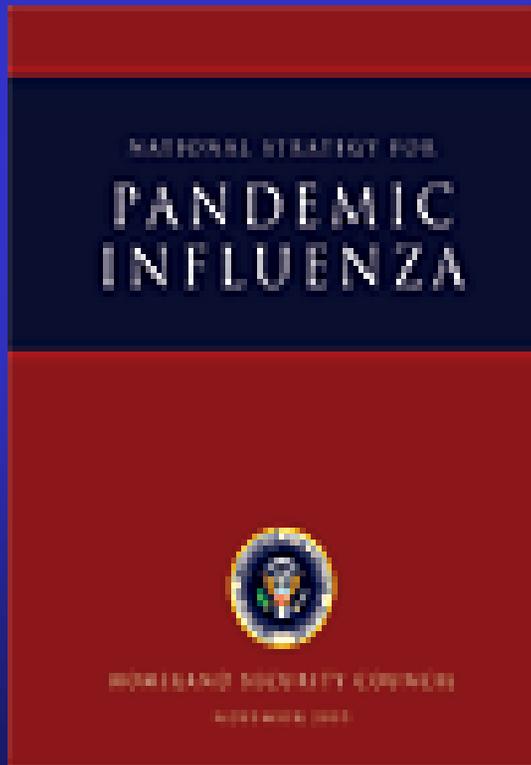
Annual Impact



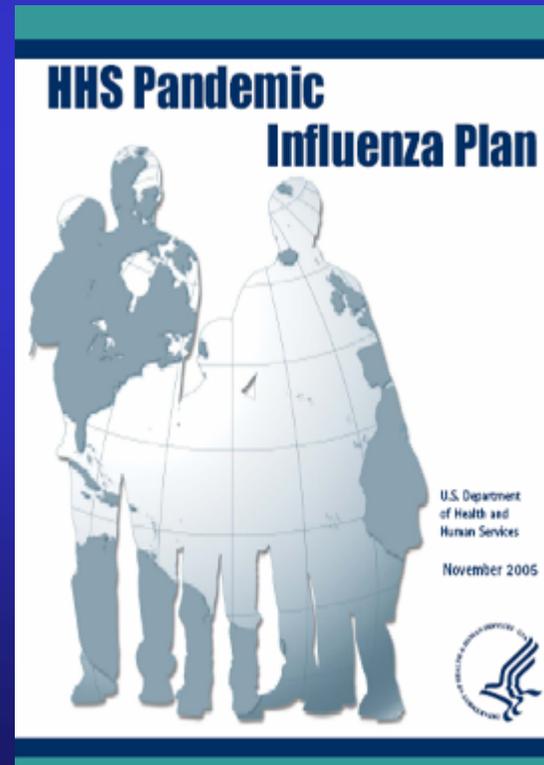
Pandemic Preparedness Activities: *A National Priority*

www.pandemicflu.gov

National Strategy for
Pandemic Influenza

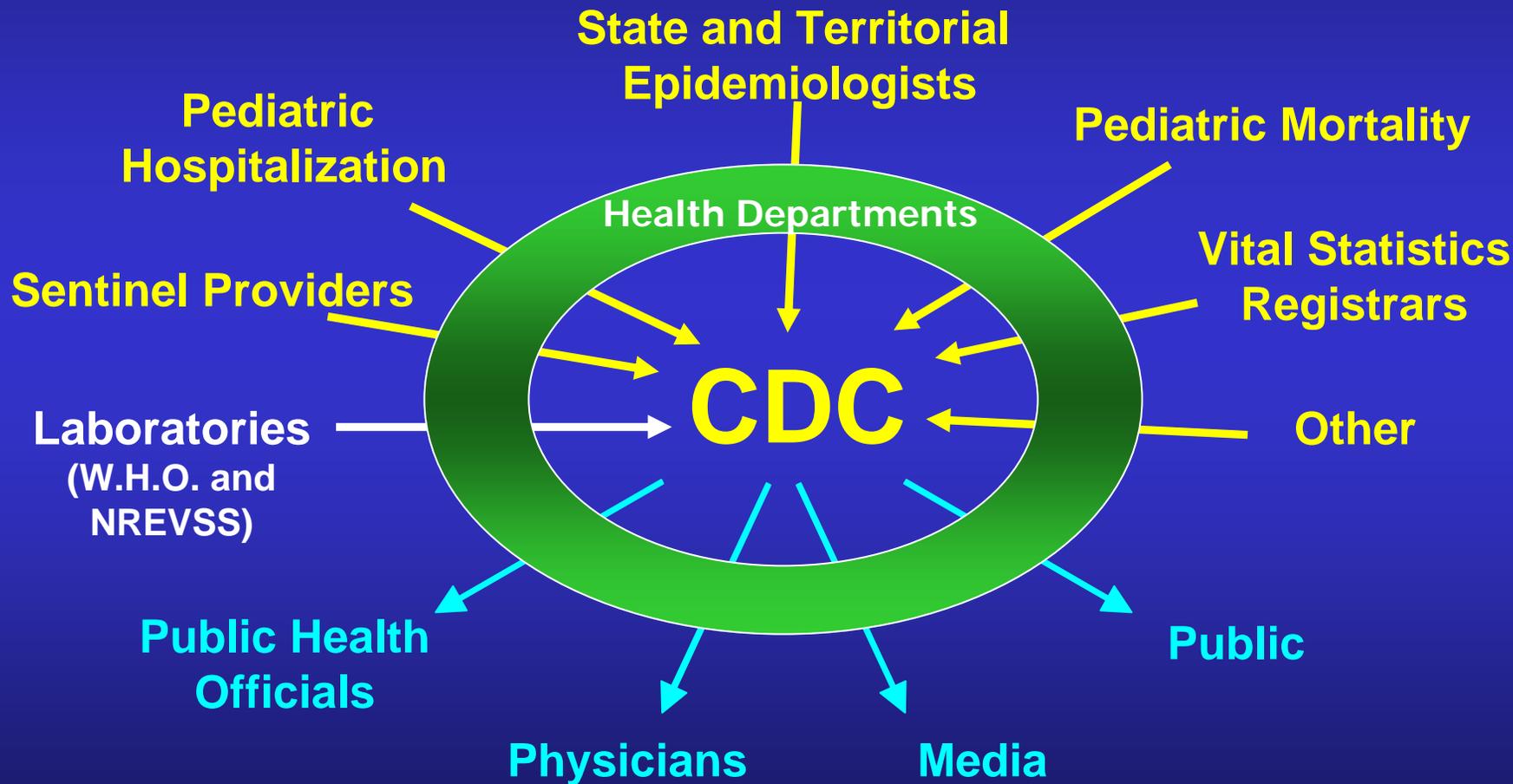


National Pandemic
Influenza Plan



U.S. Influenza Surveillance

Weekly Updates at <http://www.cdc.gov/flu/weekly/fluactivity.htm>



Objectives of Influenza Surveillance (I)

- Determine how much influenza activity is occurring (intensity and impact)
- Determine when influenza viruses are circulating*
- Determine where influenza viruses are circulating*
- Identify and characterize the types, subtypes & strains of circulating influenza viruses*
 - Monitor circulating Influenza A subtypes and strains
 - Detect novel influenza A subtypes
 - Strain analysis needed for vaccine selection
 - Monitor emergence of antiviral resistance

***Laboratory contributions**

Objectives of Influenza Surveillance (II)

- Detect unusual events*
 - Infection by novel viruses/unusual syndromes caused by influenza viruses
 - Unusually large/severe outbreaks of influenza
 - Increased mortality
- Optimize use of vaccines & antivirals*

***Laboratory contributions**

Laboratory Diagnosis of Influenza

The Expanding Role of the Clinical Laboratory (I)

Test Method	Time to Results	Comments
Culture	1-10 days	Still gold standard(?), requires expertise, provides virus for studies
Molecular (RT-PCR)	2-4 hours	Becoming gold standard(?), requires expertise & expensive equipment
Antigen Detection (IF)	2-4 hours	Requires reading expertise & IF microscope
Serology	>2 weeks	Retrospective, requires paired sera
Antigen Detection (Rapid EIA-like)	15-30 minutes	Widely available, requires little expertise

Laboratory Diagnosis of Influenza

The Expanding Role of the Clinical Laboratory (II)

Test	CLIA Status	Antigen Detected
Directigen Flu A	Non-waived	A
Directigen Flu A & B	Non-waived	A & B
Directigen EZ Flu A & B	Non-waived	A & B
Flu OIA	Non-waived	A / B
Flu OIA A/B	Non-waived	A & B
NOW Flu A and NOW Flu B	Waived/Non-waived	A & B
NOW Influenza A & B	Non-waived	A & B
QuickVue Influenza	Waived	A / B
QuickVue Influenza A + B	Waived	A & B
SAS Influenza A and Influenza B	Non-Waived	A & B
Clearview Flu A/B	Non-Waived	A & B
Xpect Flu A & B	Non-waived	A & B
ZstatFlu	Waived	A / B

Rapid Influenza Tests

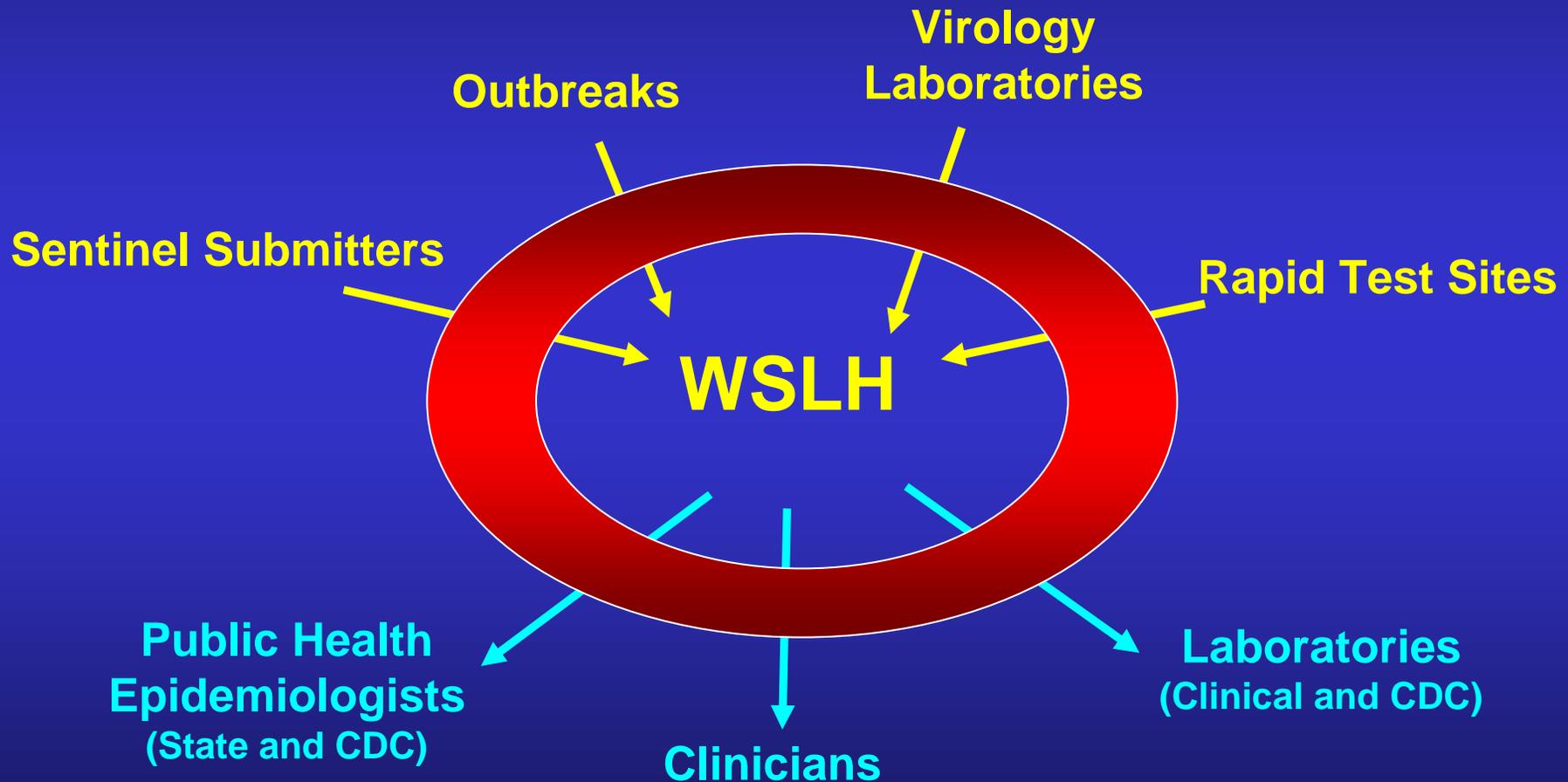
Advantages

- Rapid turn-around time
- “Stat” testing possible
- Rapid outbreak identification
- Cost-effective (?)
- Wide-spread testing possible
- Less expertise required
- Optimize antibiotic and antiviral usage

Concerns

- Performance Characteristics:
 - Poor PVP early & late season
 - Poor test sensitivity→
impact on PVN
- Biosafety issues
- Supplies of test kits
- Loss of isolates for further characterization
- Loss of surveillance data

Statewide Laboratory-Based Influenza Surveillance in Wisconsin



WSLH = Wisconsin State Laboratory of Hygiene

A disclaimer about laboratory-based surveillance in each state...

W.H.O. Framework for Pandemic Planning

Interpandemic period

Phase 1	No new influenza virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk of human infection or disease is considered to be low.
Phase 2	No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human disease.

Pandemic alert period

Phase 3	Human infection(s) with a new subtype, but no human-to-human spread, or at most rare instances of spread to a close contact.
Phase 4	Small cluster(s) with limited human-to-human transmission but spread is highly localized, suggesting that the virus is not well adapted to humans.
Phase 5	Larger cluster(s) but human-to-human spread still localized, suggesting that the virus is becoming increasingly better adapted to humans, but may not yet be fully transmissible (substantial pandemic risk).

Pandemic period

Phase 6	Pandemic phase: increased and sustained transmission in general population
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Postpandemic period

Return to interpandemic period.

Elements of Laboratory-Based Influenza Surveillance

The PHL should...

- Enlist diagnostic testing sites
- Collect and summarize influenza testing data
 - Number of specimens tested/wk; number and identification of positives → “*prevalence surrogate*”
 - Provide data summaries to partners
- **Obtain patient specimens/influenza isolates for further characterization & referral to CDC***
- Provide protocols for suspect avian or other novel influenza testing
- Provide identification/monitoring of other pathogens
- Serve as link to CDC and best immediate source for consultation

Recommendations for Enhancing Laboratory-Based Influenza Surveillance

The PHL should...

- **Incorporate rapid test sites as key partners**
 - **Provide confirmatory testing for rapid test results**
 - **Monitor test data**
 - **Access patient specimens**
- Develop PCR-based testing algorithms for surveillance
- Incorporate other clinical PCR testing sites into influenza surveillance
 - Provide public health testing protocols to clinical labs
 - Collect clinical testing data from clinical labs
 - Refer samples for test verification, confirmatory testing & subtyping and repositories
- Expand influenza surveillance to year-round

Laboratory-Based Surveillance for Influenza

Direct benefit for clinical labs includes...

- Assistance in optimizing rapid influenza testing
 - Prevalence data for rapid test interpretation
 - Confirmation of early, late, and out-of-season positives; peak season negatives
 - Training in use and interpretation of rapid tests
- Guidance on biosafety *
- No cost spec. collection and shipping supplies, transport
- Protocols for suspect avian or other novel influenza testing
- Support for pandemic planning
- Communication/information
 - about unusual occurrences,
 - current status of influenza activity
 - Just-in-time emergency response (e.g.H2N2)

Rapid Tests: Biosafety Concerns in an Age of Emerging Diseases

Reasons for Concern: SARS, avian influenza, influenza A (H2N2)

Addressing the Concerns:

- Enhance communication with ID Drs., Infection Control
 - Need patient travel history
- Perform risk assessment
- Consider strategies to enhance biosafety
 - Use BSC, additional PPE, isolated testing area
- **Need for a new model for biosafety in the laboratory?**
 - Universal (“Standard”) precautions for blood in the 80’s
 - Enhanced precautions for suspect EIDs in the 2000’s?

Pandemic Influenza Period: *The Laboratory's Responsibilities*

Clinical Laboratories

- Perform diagnostic testing for influenza (stat)
- Maintain other diagnostic services
- Support surveillance activities
- Continue clinician education

Public Health Laboratories

- Maintain **surveillance** activities
- Conduct **special studies** with CDC
- Maintain **reference testing** for influenza
- Maintain **emergency response** for other outbreaks (e.g., foodborne)
- Continue **education** of clinicians & laboratorians
- Share **data/information** in “real-time”
- Maintain other diagnostic services?

THE LRN FOR Bioterrorism

PUBLIC HEALTH EMERGENCIES

